OLYMPUS

Maintenance Manual
for maintenance engineer

CX21

Thank you for purchasing the Olympus microscope CX21.
In order to fully utilize its performance and secure optimum condition, please read this manual before maintenance work.
Please also keep it at hand during maintenance as well as for future reference.

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INTRODUCTION

The purpose of this manual is to satisfy any requirements for maintenance material that maybe considered as necessary to professionals in the maintenance field, such as Maintenance engineer in Hospitals.
It is intended to be used as a tool for performing basic maintenance procedures if needed or when required as per the recommended maintenance schedule.

The sections from this manual only cover procedure pertaining maintenance 's that are considered to be easily performed. For more involved maintenance's or repairs, it is recommended that you contact a qualified service engineer from your local Authorized Olympus dealer.

Maintenance parts, grease, and other items specified in the manual can be ordered from your Authorized Olympus dealer, and subject to change without notice.

The recommended maintenance schedule is shown below as reference. (* Necessary item)

Portion	Cleaning	Optical/mechanical check	Maintenance schedule
Optical components 1) Outer surface Eyepiece, objective, condenser lens, filter, 2) Inner part Prism, internal lenses	* *		Once in a year (If dirt is conspicuous or oil immersion objective is used, cleaning should be made after every use.) Once in a year
Appearance Microscope frame, mechanical part	*		Once in a year (If dirt is conspicuous, cleaning should be made after every use.)
Observation tube		* Optical adjustment: 1) Optical axis (standard) 2) Left/right optical axis 3) Revolving axis 4) Parfocality	Once in a year
Mechanical part Focusing unit, stage, revolving nosepiece, aperture iris diaphragm		* Mechanical movement: Grease replacement Mechanical adjustment	Once in two to three years

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CHAPTER 1
MAINTENANCE PROCEDURE

1. Maintenance of Microscope

1) Fundamental handling

a. Read the instruction manual thoroughly, handle the microscope correctly.

b. Be sure to make a usual cleaning, especially after every use of microscope.

c. When handling the microscope, do not expose it to shock, moisture, heat and dust.

d. If the problem occurs, do not treat it in self-judgement.

2) Using and storing conditions

a. The microscope should be used under no vibration.

If it is placed in such environment as vibration, this causes disturbance and fatigue in observation.

b. It should not be stored in high humidity.

Such condition causes fungus, corrosion on lens and rust on metal part.
Therefore, special caution is exercised if stored in a long period of time.

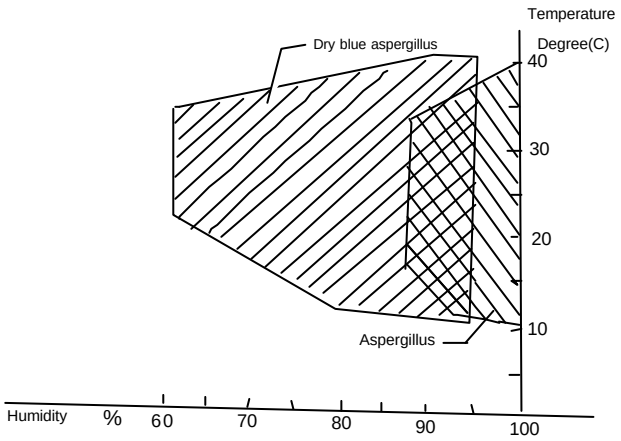
c. Intense temperature change should be avoided.

Be careful not to place the microscope near window exposed to direct sunlight and air conditioner. When bringing it into warm room from cold storage location in winter, condensation occurs on lens and metal part, it causes fungus and rust.

d. It should be kept clean.

The microscope is required to keep away from dust that causes contamination, fungus on lens and failure of sliding part in the frame.
Be careful not to place it in the environment where the corrodent chemicals such as hydrogen sulfide, hydrogen fluoride and acid are handled.

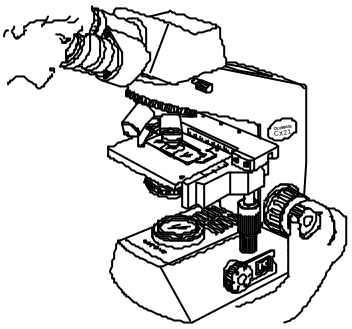
<Reference> fungus: occurrence conditions



2. Guide to Maintenance

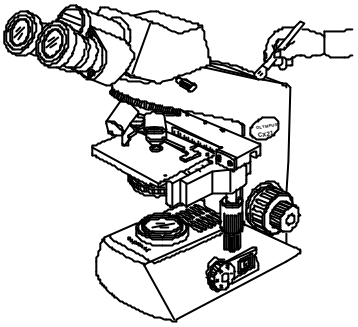
2-1 Overview of maintenance

1)



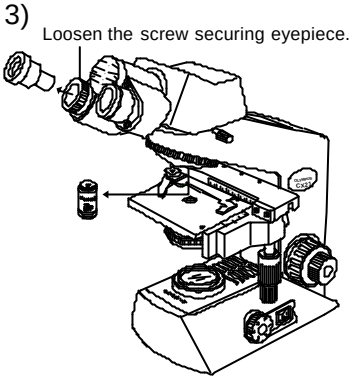
Set your correct interpupillary distance. Note any areas suggesting a need for mechanical and/or optical maintenance by operating it or observing a specimen.

2)



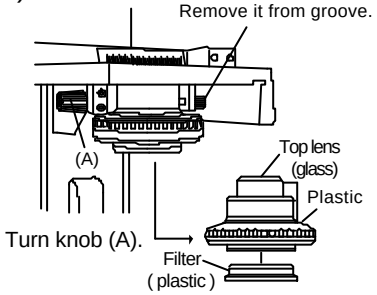
Sweep off dust on the outer surfaces with the soft brush. If there are stains on the microscope frame, clean them with neutral detergent.

3)



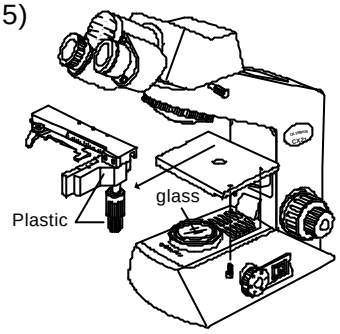
Remove the eyepieces and objectives, then clean their lenses with cleaning solution. (When removing the objective, use the rubber band.)

4)



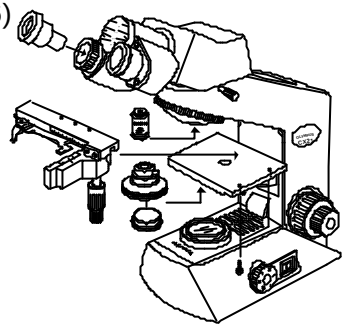
Remove the condenser downward. Wipe off any dirt spots on the surface of top lens, filter. The plastic parts should be cleaned with netural detergent.

5)



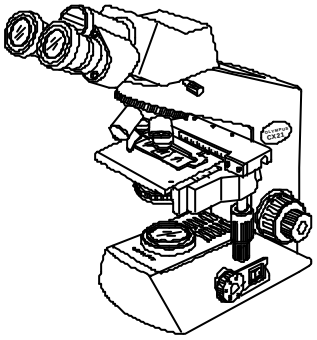
Take off the mechanical stage from the plane stage by removing two screws. Clean the surface of stage and filter on the base cover.

6)



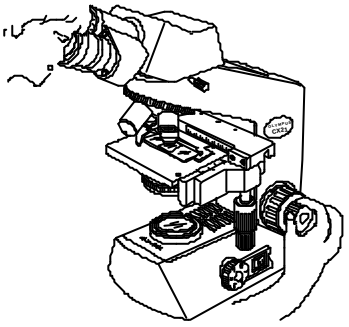
Mount the removed components and mechanical stage to the frame.

7)



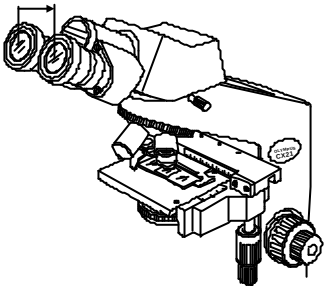
Polish all plastic components and the frame with silicon cloth.

8)



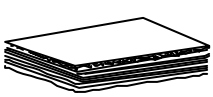
Return the interpupillary distance to original condition and prepare for the inspection. (see page 6)

9)

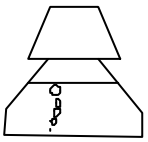


Do a final check following the inspection sheet in this manual. (See page 7)

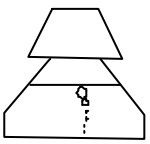
Tool required:



Lens tissue



Neutral detergent (For plastic part or frame)



Cleaning solution (For lens or filter etc.)

Cotton swab or tweezers etc.

Blower

Silicon cloth (For finishing)

2-2 Cleaning method for the optical components

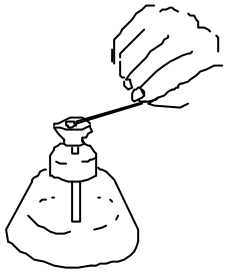
Required tools:

1) Lens tissue
2) Cotton swab or tweezers etc.
3) Blower
4) Magnifier (Eyepiece is possible to be used by turning it upside down. Refer to page 10.)
5) Cleaning solution: e.g. Alcohol

Before cleaning: Lightly brush the lens surface or blow with the blower before wiping with tissue. This removes particles that may scratch the lens surface. (to protect the lens coating)

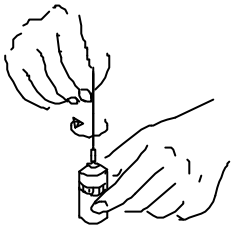
HOW TO CLEAN THE OBJECTIVE LENS

1



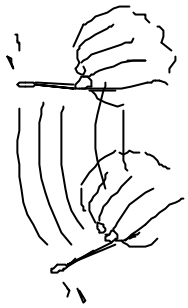
Moisten the tip of cotton swab with cleaning solution.

2



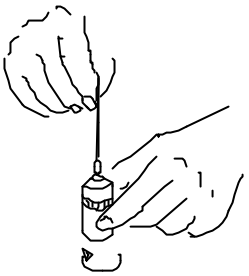
With a circular motion, wipe the top lens surface with the cotton swab, to thoroughly remove any oil or dirt from the lens.

3



Dip a new cotton swab in the cleaning solution and shake vigorously to remove any excess cleaning solution.

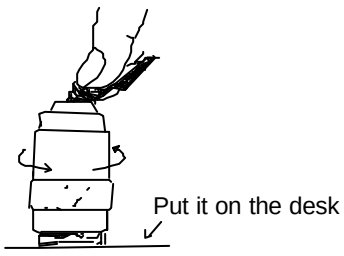
4



Wipe the objective lens from the center towards the periphery, while rotating the lens.

When the lens size is large and difference in level between the lens and the lens frame is small:

Fold the lens tissue several times and moisten it with cleaning solution.
After that, apply the folded line edge to the center of lens, push it with index finger and turn the objective by the other hand to clean the lens while moving it from the center towards the periphery.

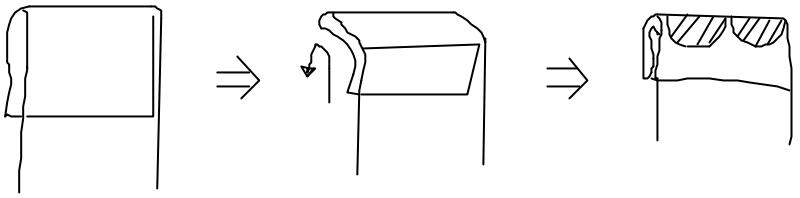


Cleaning the immersion objective:

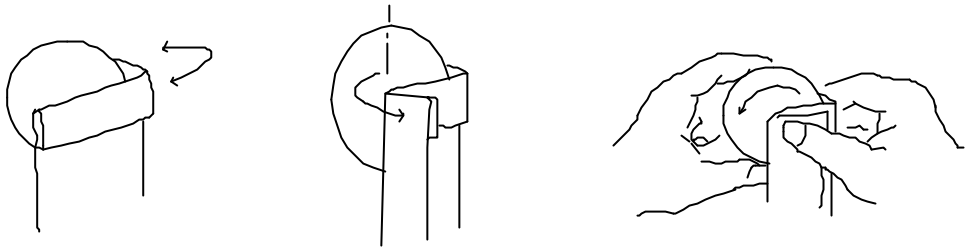
Wipe off the immersion oil while absorbing it with lens tissue that is not moistened. After that, clean the lens as the same manner mentioned on the left. When the top surface of lens frame is higher than that of lens and remained dirty portion on the periphery of lens can not be wiped off, clean the lens referring the above figures, 1 to 4.

HOW TO CLEAN THE FILTER

Fold the lens tissue into two or three layers and moisten its shaded part with cleaning solution.

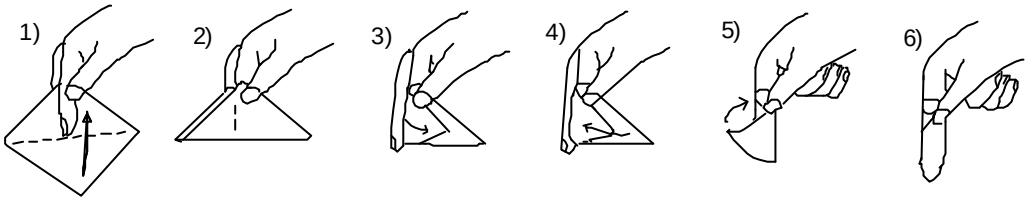


Hold the filter at its edge and fold the lens paper from the lens center to outside as illustrated.
Move the lens tissue gradually to outside while turning the filter by left hand.

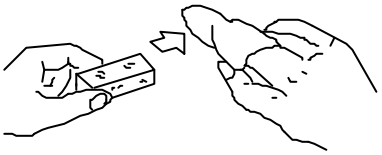


HOW TO CLEAN THE PRISM

Hold a sheet of lens tissue between your middle and index fingers, then fold and wrap it around your index finger. Hold the tissue down with your thumb and moisten it with sufficient cleaning solution.



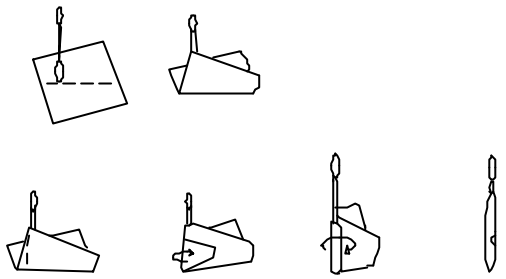
Wipe the prism surfaces from front to backward at a stroke, applying even pressure.



HOW TO CLEAN THE EYEPIECE

1

Wrap a sheet of lens tissue around a cotton swab as illustrated. If the area to be cleaned is large, wrap the lens tissue looser and thicker. Otherwise, make a thin, tight wrap.



2

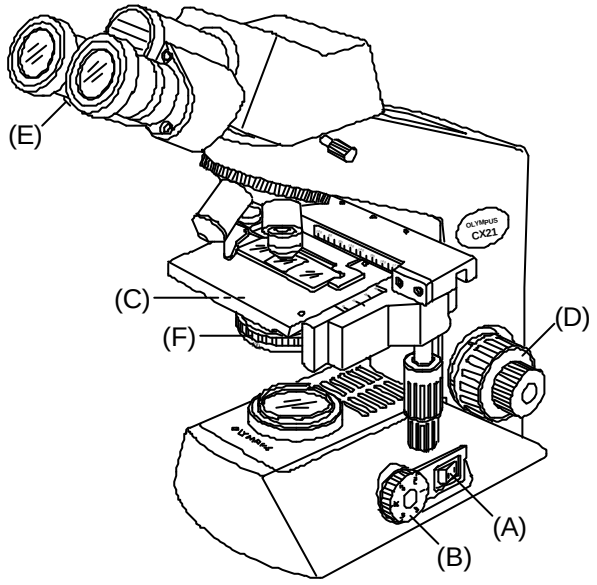
Dip the wrapped lens tissue in the cleaning solution, and wipe the eyepiece from the center towards the periphery in a circular motion.

Important notes:

1) Never rub the lens surface strongly.
2) Do not use the same lens tissue to clean more than one lens.
3) Do not moisten the lens tissue with an excessive amount of cleaning solution.
4) When cleaning with tweezers, be careful not to protrude its tip from the lens tissue.

3. Preparing for Inspection

1) Set the main switch “A” to “I” (ON).
2) Adjust the brightness by turning the adjustment knob “B” .
3) Place a specimen on the stage.
4) Engage the 10X objective in the light path.
5) Rotate the condenser height adjustment knob ”C” to move the condenser to the highest position.
   * The condenser is usually used in the highest position. If the entire observed field of view is not bright enough, brightness may be improved by lowering the condenser slightly.
6) Looking through the eyepiece in the right sleeve without the diopter adjustment ring, turn the coarse and fine focus adjustment knobs “D” to bring the specimen into focus.
7) Looking through the eyepiece in the left sleeve with the diopter adjustment ring, turn only the diopter adjustment ring “E” to focus on the specimen.
   (At this time, adjust the interpupillary distance so that the binocular visions on the left and right fields of view coincide completely.)
8) Adjust the aperture iris diaphragm;
   Since the aperture irirs diaphragm has an objective magnification scale (4X, 10X, 40X,100X), rotate the diaphragm ring “F” so that the magnification scale corresponding to the objective in use faces frontward.



4. CX21 Inspection Sheet

Model :		**Check Date :**	
S/N :		**Checking by:**	
Check Point	**Check Contents**	**Result**	**Ref. Page**
1. Electrical unit	1) When the power switch is turned on, the lamp is lit and the brightness can be varied by adjustment knob.	OK / NO	18
2. Coarse/fine focus adjustment knob	1) The coarse/fine focus adjustment knob is smoothly moved without any stress or unevenness.	OK / NO	17
	2) The tension of coarse focus adjustment knob can be adjusted by the adjustment ring.	OK / NO	
	3) The upper limit is changed by turning the stopper on the upper side	OK / NO	
3. Stage	1) The plane stage should not fall spontaneously.	OK / NO	
	2) A specimen is held securely by the specimen holder.	OK / NO	
	3) The X/Y movement of mechanical stage is smooth without unevenness, backlash or slipping.	OK / NO	15
4. Observation tube	1) The interpupillary distance adjustment can be operated smoothly in working range.	OK / NO	
	2) When changing the interpupillary distance, the displacement of optical axis is not apparent.	OK / NO	
	3) The diopter adjustment ring is moved smoothly in working range.	OK / NO	
	4) The optical axis of left side coincides with that of right side.	OK / NO	11, 12, 13
5. Revolving nosepiece	1) The revolving nosepiece can be rotated smoothly and stops at the click position.	OK / NO	
6. Condenser	1) The vertical movement of condenser is smooth.	OK / NO	
7. Visibility (Observation)	1) Observation image is normal. Without flares /ghosts / vignetting /uneven illumination	OK / NO	
	2) Dust and dirt are not noticeable in observation.	OK / NO	8, 9
Remarks:			

CHAPTER 2
INSPECTION PROCEDURE

1. Checking Performance of Microscope

Using the CX21 inspection sheet (P.7), check the electrical unit, mechanical and optical performance.

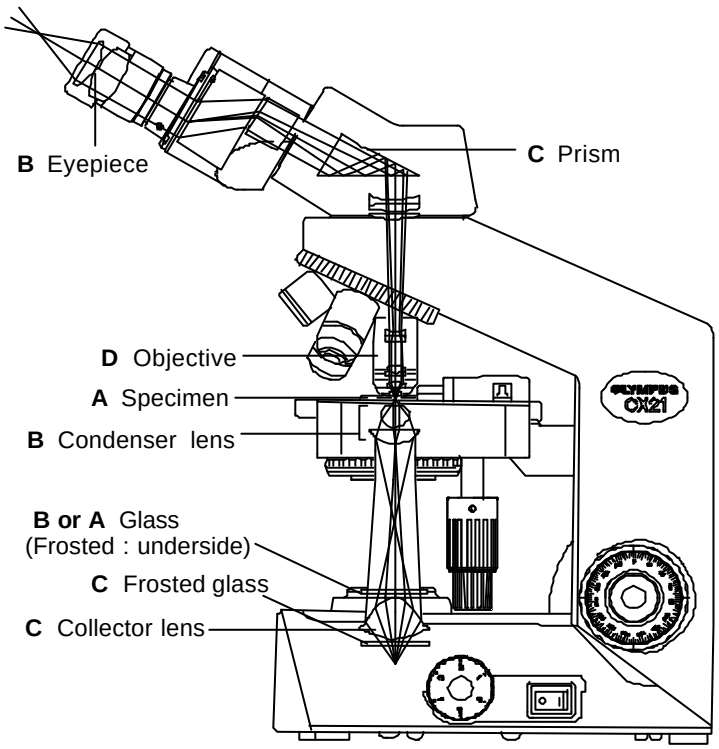
2. Checking Dirty Portion

2-1 Image influence caused by dirt on each component

The following figure shows the influence of image on each optical component if stains or dust is adhered to that portion.

In general, the microscope image is largely affected by dirt adhered on the nearer portion to a specimen and image surfaces.

Therefore, the optical components should be kept clean and dust-free.



A: Dirt is clearly seen.
B: Blurred contours of dirt is seen.
C: Dirt is seen when the aperture iris diaphragm is stopped down.
D: Dirt is not directly seen, but contrast of image deteriorates.

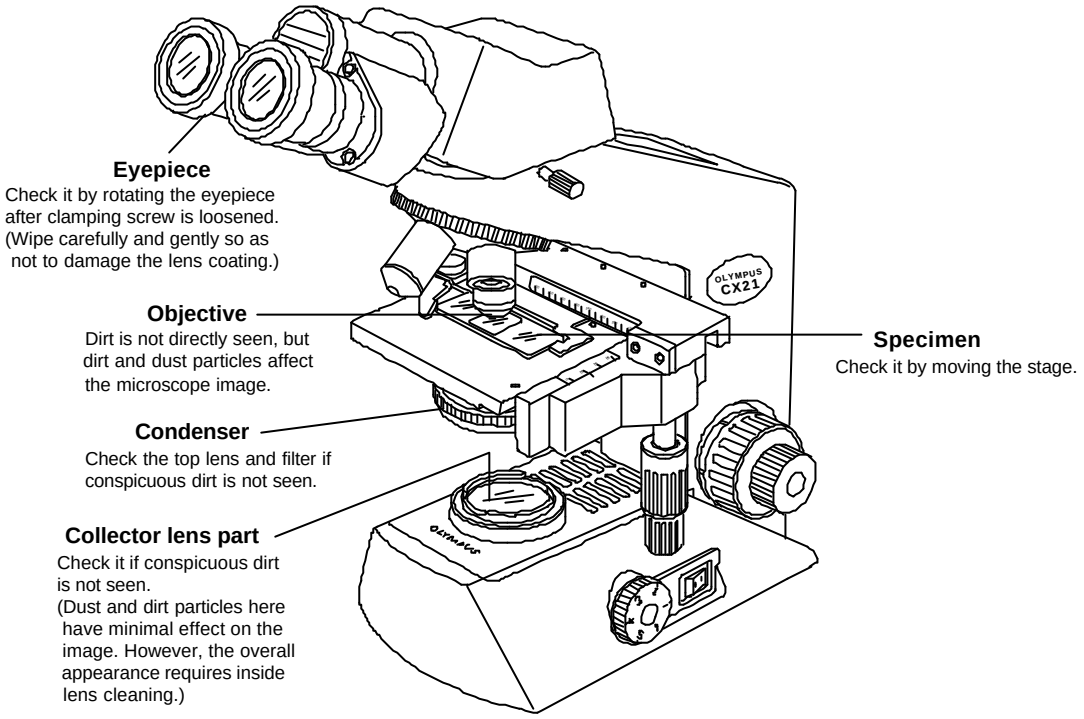
2-2 How to find dirty portion through observation

1) Close the aperture iris diaphragm.

   (When the aperture iris diaphragm is closed, it facilitates finding the dirt particles because the depth of focus increases and the dirt position bring into focus. However, very small dirt particle may not be found in this method.)

2) Observe a specimen through the eyepiece.

   If dirt is seen by observing it, look for the portion where stains or dust is adhered by following the description below.


Eyepiece
Check it by rotating the eyepiece after clamping screw is loosened. (Wipe carefully and gently so as not to damage the lens coating.)
Objective
Dirt is not directly seen, but dirt and dust particles affect the microscope image.
Condenser
Check the top lens and filter if conspicuous dirt is not seen.
Collector lens part
Check it if conspicuous dirt is not seen. (Dust and dirt particles here have minimal effect on the image. However, the overall appearance requires inside lens cleaning.)
Specimen
Check it by moving the stage.
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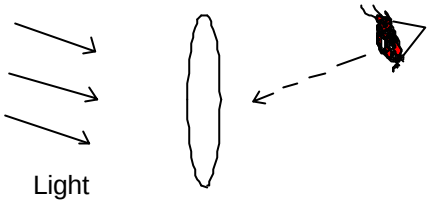
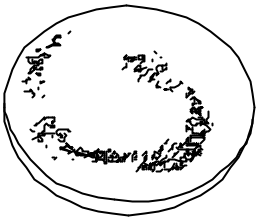
Note: If dirty portion can not be identified in the above, it is assumed that internal lens and prism are contaminated.
In this case, please contact your Authorized Olympus dealer.

2-3 How to check cleaning condition

1) When a large lens is checked, look at the lens while putting it toward bright side or breathe on the lens and observe the condition that the haze on the whole surface of the lens disappears evenly.

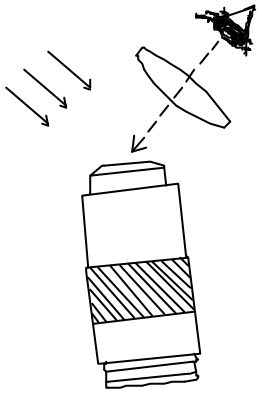


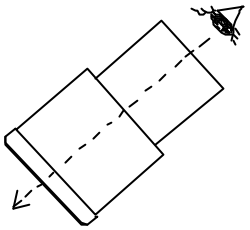
Dust becomes conspicuous when looking at it with the lens inclination changed.



If there is a dirty part or a remained part that is not cleaned completely, the haze of this part will disappear slower than that of the other part.

2) For a small lens such as top lens of objective, check it by magnifier.





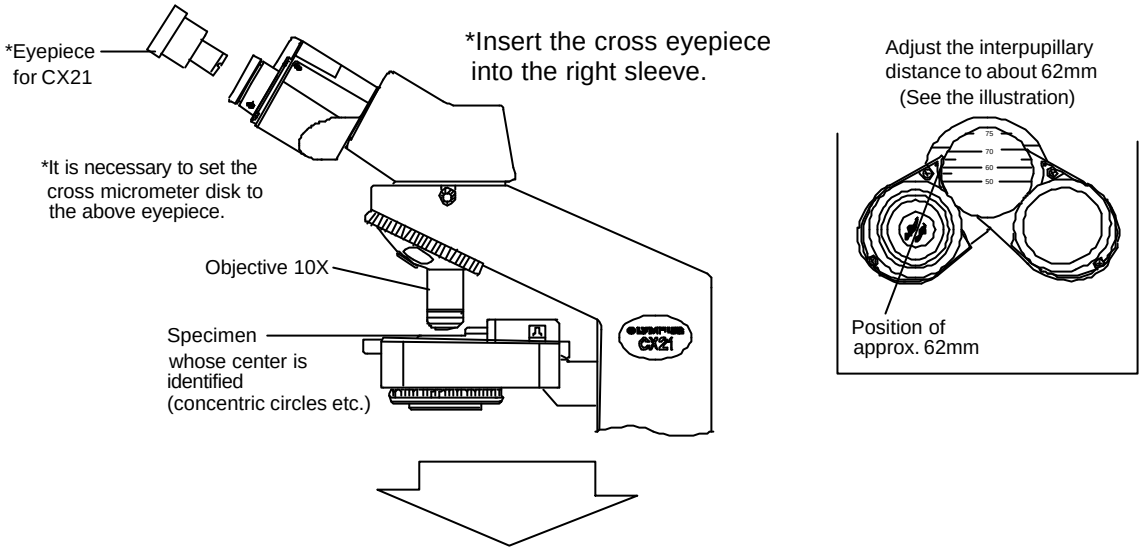
An eyepiece can be substituted for magnifier by turning the eyepiece upside down.

CHAPTER 3
REPAIR PROCEDURE

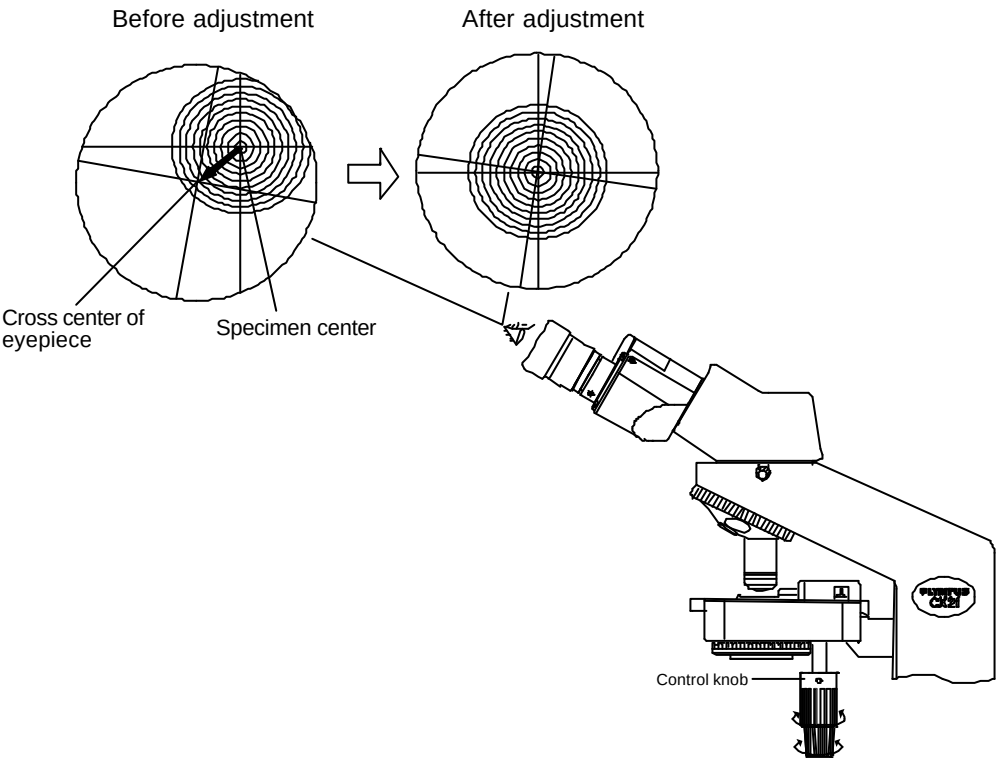
1. Optical Adjustment

PREPARATION Adjusting the left/right optical axis

If the left/right optical axis is remarkably displaced at checking, perform the following adjustment.

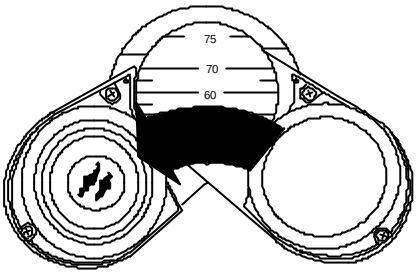
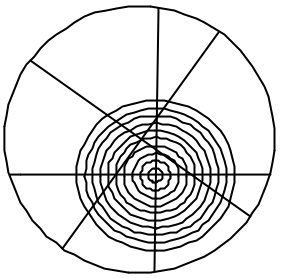

*Eyepiece for CX21
*Insert the cross eyepiece into the right sleeve.
Adjust the interpupillary distance to about 62mm (See the illustration)
*It is necessary to set the cross micrometer disk to the above eyepiece.
Objective 10X
Specimen whose center is identified (concentric circles etc.)
Position of approx. 62mm

Align the specimen center with the cross center of the eyepiece by turning the control knob of the stage.

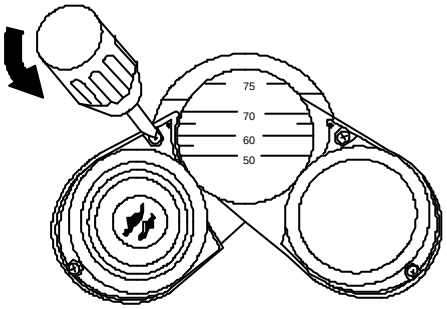
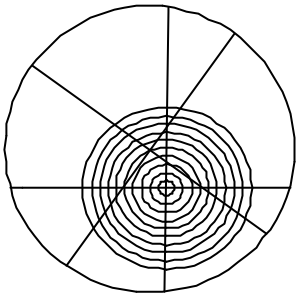
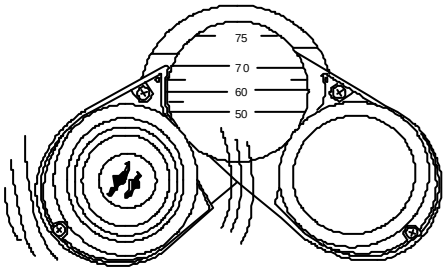
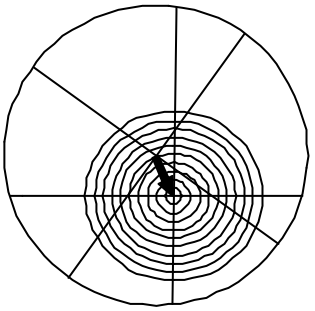


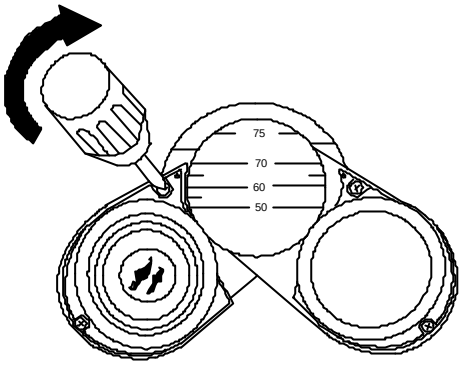
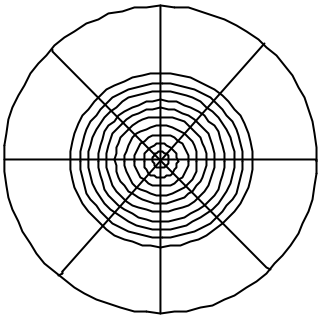
ADJUSTMENT THE LEFT/RIGHT OPTICAL AXIS

(1) Moving the cross eyepiece to the left sleeve

Work	Image seen through the cross eyepiece
Move the cross eyepiece to the left sleeve. 	If the optical axis between left and right sleeve is deviated, the center of the specimen and the cross center of eyepiece are also deviated. 

(2) Aligning the cross center of eyepiece with the specimen center

Work	Image seen through the cross eyepiece
1. Loosen the two screws slightly which secure the left sleeve. 	Image at first 
2. Align the center of eyepiece with the specimen center while observing through the eyepiece. (Change the left sleeve position by hand.) 	The center is aligned. 

3. Firmly tighten the screws which secure the left sleeve. 	Image at the end of adjustment 

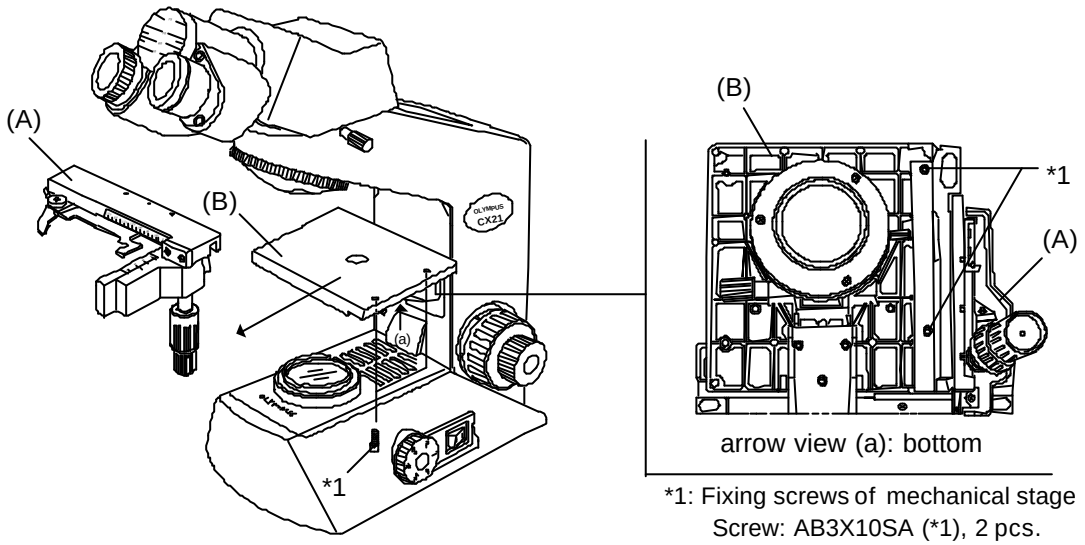
* If this adjustment could not be done, inside mechanism may be damaged.
  Please contact your Authorized dealer.

2. Mechanical Adjustment

2-1 Preparation for the tension adjustment of X/Y-wire

If a specimen image is moved when the stage is brought into the desired position of specimen, it is necessary to adjust the wire tension of stage.

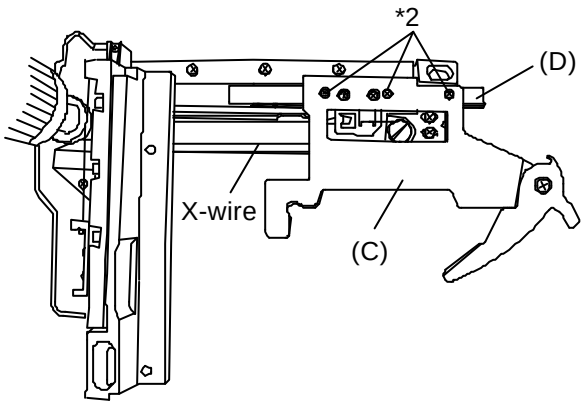
1) Take off the mechanical stage (A) from the plane stage (B) by removing the two screws (*1).



*1: Fixing screws of mechanical stage
Screw: AB3X10SA (*1), 2 pcs.

2) Remove the specimen holder (C) from the inner guide (D).

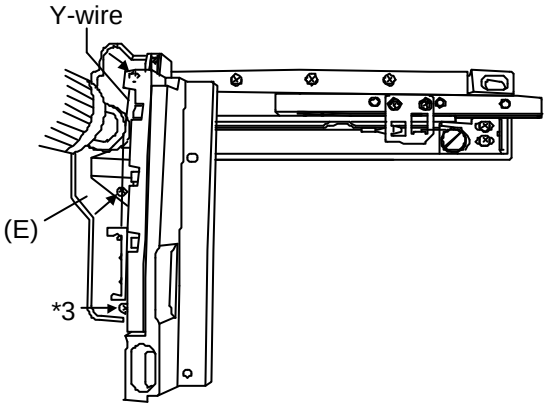
Screw: 3PSK2X4SA (*2), 3pcs.



* For the tension adjustment of X-wire, refer to next page.

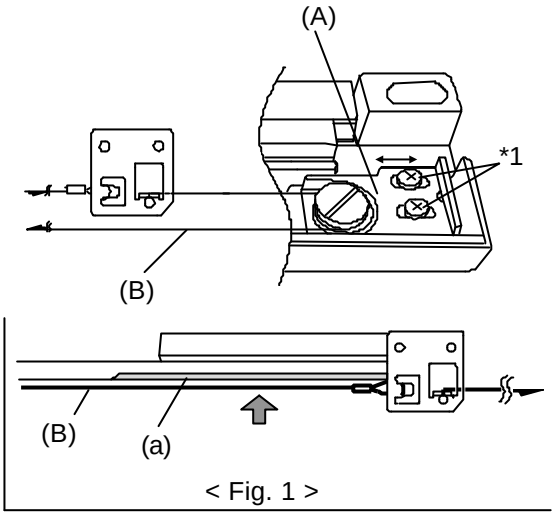
3) Remove the Y-cover (E).

Screw: CUTB3X8SA (*3), 3pcs.
<indicated by arrows>



* For the tension adjustment of Y-wire, refer to next page.

2-2 Adjustment method for the tension of X-wire



< Fig. 1 >

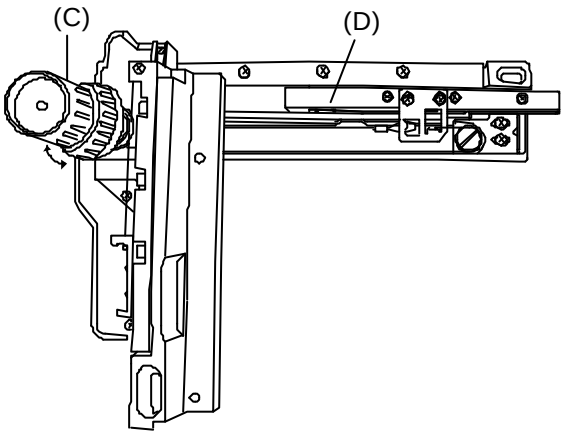
1) Loosen the screws (*1) securing the holder (A).

   Screws: CUK 3X6SA (*1) 2pcs.

2) Adjust the tension of the X-wire (B) by moving the holder (A) in arrow directions as shown in the left figure.

3) Temporarily tighten the screws (*1).

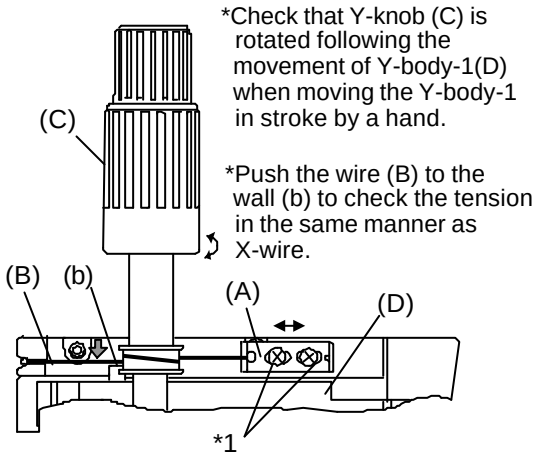
4) Check the tension of X-wire if it is too tight or loose while pushing the X-wire (B) to the wall (a) in arrow direction. <Fig.1>



If the tension of wire is loose, slip may occur between the X-knob and X-wire.
Therefore, check that X-knob (C) is rotated following the movement of guide (D) when moving the guide in stroke by a hand.

If the tension is too tight and the X-wire does not come in contact with wall (a) due to no deflection, it may cause image backlash. Therefore, confirm it in observation state as described below.

2-3 Adjustment method for the tension of Y-wire


*Check that Y-knob (C) is rotated following the movement of Y-body-1(D) when moving the Y-body-1 in stroke by a hand.
(C)
*Push the wire (B) to the wall (b) to check the tension in the same manner as X-wire.
(B)
(b)
(A)
(D)
*1

1) Loosen the screws (*1) securing the holder (A)

   Screws: CUK 3X6SA (*1) 2pcs.

2) Adjust the tension of the Y-wire (B) by moving the holder (A) in arrow directions as shown in the left figure.

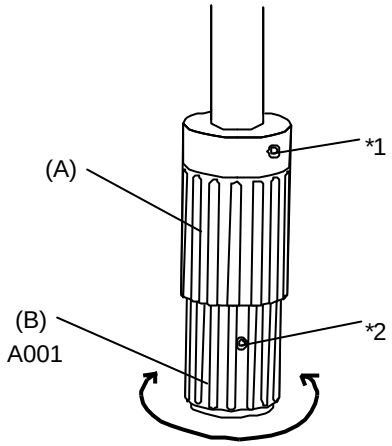
3) Temporarily tighten the screws (*1).

4) Check the tension of Y-wire if it is too tight or loose while pushing the Y-wire (B) to the wall (b) in arrow direction.

Confirmation of X/Y-wire tension in observation state :

1) After checking the above condition, Install the mechanical stage to the plane stage in reverse order of disassembly 1) on page 14, set the microscope at observation state and check that image is brought into the desired position without backlash (2 microns: with100 X objective).
2) If it is out of standard, repeat the above procedures until the condition is satisfied.
3) In case where the image backlash can not be eliminated, perform the knob tension adjustment referring to 2-4 on page 16.

2-4 Final adjustment



< Fig. 2 >

Image backlash adjustment:

1) Under observation state (with 100X objective), move the stage to the desired image position by turning the Y-knob (A).
   At that stop position, check image backlash.
   If it is over 2 microns, conduct the following adjustment.

2) When adjusting the Y-movement, loosen the two screws (*1) and turn the Y-knob (A) to bring backlash within 2 microns.

   * After turning the knob and temporarily tighten the screws, check image backlash in the observation state. Repeat the adjustment until image backlash is within the standard.

   Screws: AWU3X4SA (*1) 2pcs.

3) For the X-movement, adjust image backlash by turning the X-knob (B) and check it in the same manner as the Y-knob.

   Screws: AWU3X4SA (*2) 2pcs.

* The tension of X/Y knob becomes heavy or light by turning the knob as following direction.
  <Fig.2>

	clockwise	counterclockwise
X-knob (B)	light	heavy
Y-knob (A)	heavy	light

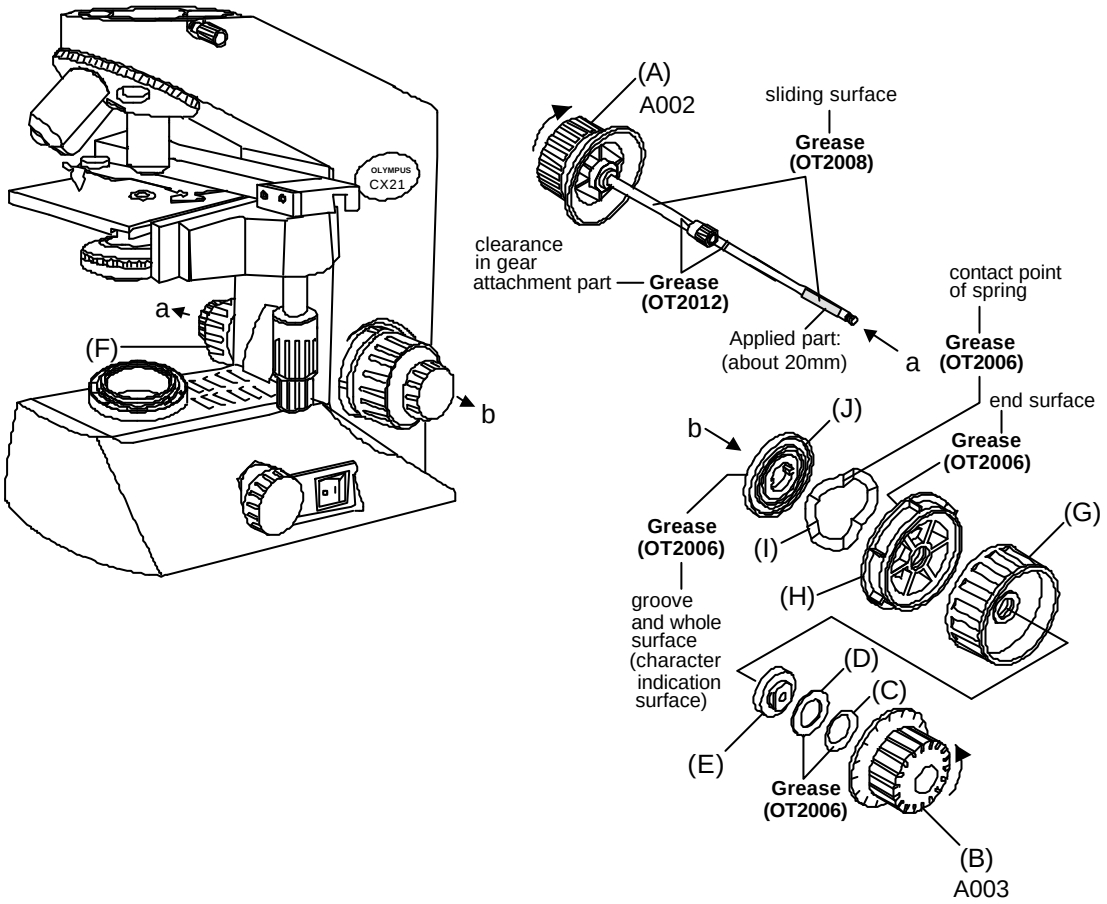
3. Replacing Grease for Coarse/fine Adjustment Knob Ass'y

If the coarse/fine adjustment knob is not turned smoothly, replace greases on the portions described below.

(In case where the coarse adjustment knob is not turned evenly or the stage can not be moved vertically, please contact your Authorized Olympus dealer because it is necessary to disassemble the left coarse adjustment knob (F) with shaft and/or guide unit.)

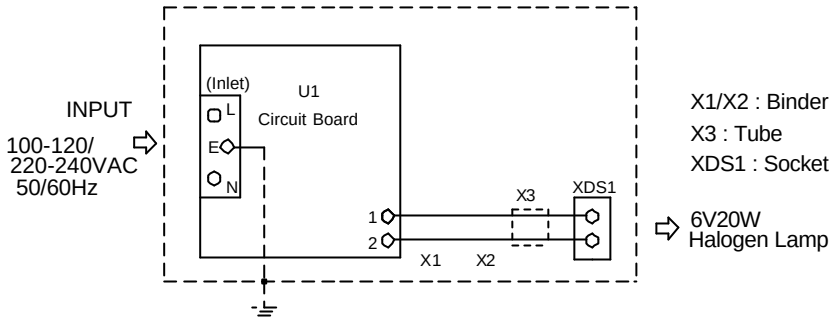
< Disassembling coarse/ fine adjustment knob>

1) Remove the fine adj. knob ass'y (A) and fine adj. knob (B) by turning them in arrow directions.
   (In fine adj. knob ass'y, the left fine adj. knob is fixed to the shaft with adhesive,OT1006)
2) Remove the spring washer (C) and washer (D).
3) Remove the fine shaft mount (E) with a spanner while holding the coarse adj. knob (F).
4) Remove the coarse adj. knob (G) by turning it counterclockwise while holding the coarse adj. knob (F).
5) Remove the tension knob (H) by turning it counterclockwise.
   (The washer (I) is attached to tension knob (H) with grease.)
6) Pull out the tension ring (J) while holding the convex part using a plier.
7) Reassemble them in the reverse order.
   (For applied portions of greases, refer to the figure on the right below.)



4. Replacing Circuit Board

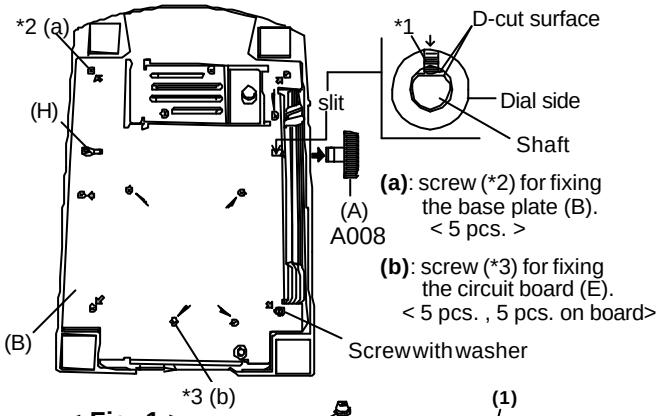
4-1 CX21 wiring diagram



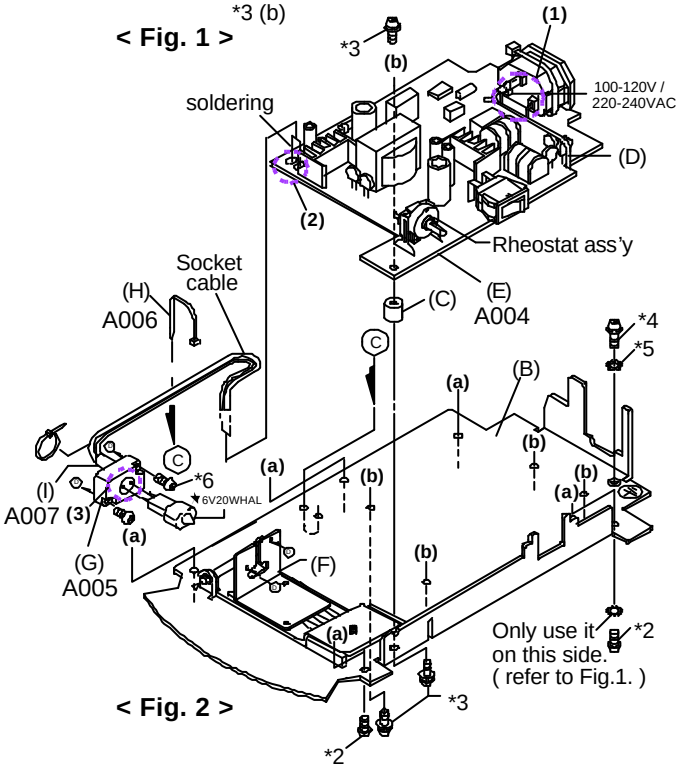
If the lamp is not lit, check if the halogen bulb (6V20W) is broken or lamp socket is burned and also check that the voltage is being outputted each from (1), (2), (3) using multimeter to identify the defective part. (Refer to the figure below.)

In case where there is a problem in the circuit board, replace the circuit board as a whole because the components can not be supplied. Since the rheostat ass'y is incorporated in the circuit board, the voltage adjustment is not necessary. (It has been already adjusted: Min. 1.5V or less, Max. 4.5V +/-0.3)

4-2 Replacement of circuit board / socket



< Fig. 1 >



< Fig. 2 >

(1) Insert a Allen wrench from the slit of bottom and loosen the screw (*1) as shown in Fig.1.

Screw : ACU3X5SA (*1), 1pc.

(2) Pull out the dial (A) in arrow direction.

(3) Take off the bottom plate (B) by removing the screws (*2) indicated by (a) as shown in Fig.1 and Fig.2.

Screws : CUK3X6SA (*2), 5pcs.
Washer : HWB3SA, 1pc.
(only use it on the lower right as show in Fig. 1.)

(4) Remove the spacers (C) by removing the screw (*3) indicated by (b) as shown in Fig.1 and Fig. 2.

Screws : CUKSK3X6SA (*3), 10pcs.
(Spacer: 5pcs; 2 screws are used in 1 spacer as shown in Fig.2.)

(5) Remove the ground wire (D) from the bottom plate (B).

Screw : CUKSK4X6SA (*4), 1pc.
Washer : HWB4SA, (*5), 1pc.

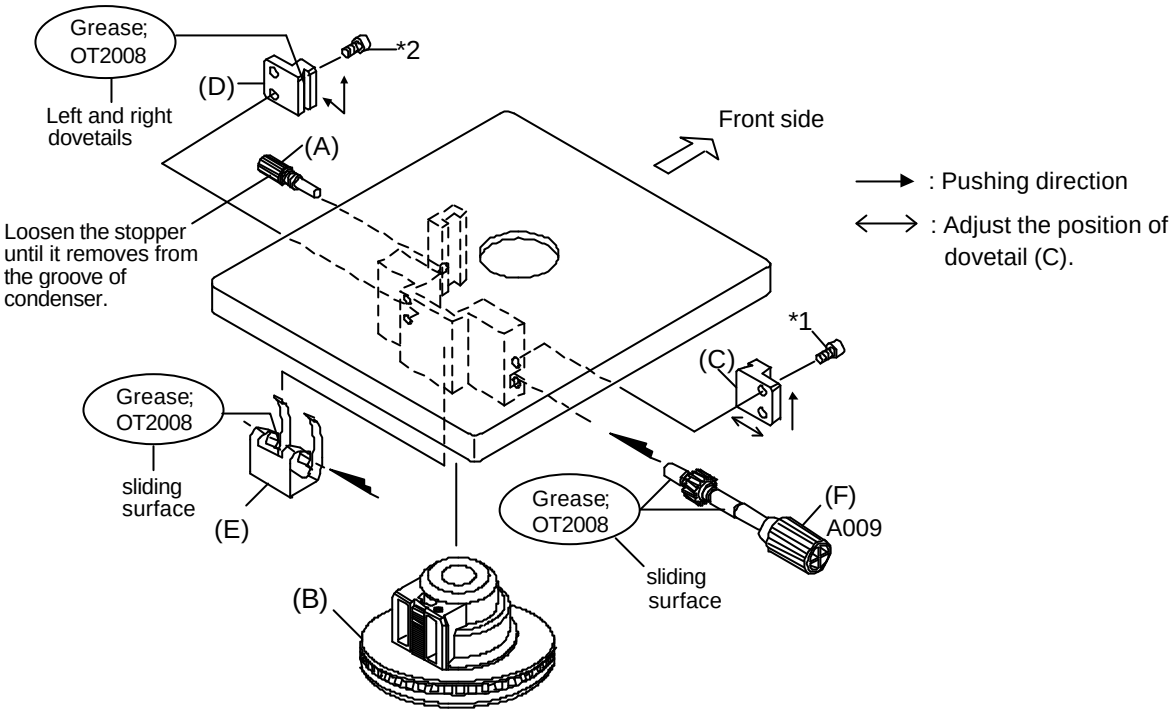
(6) Disconnect the socket cable from the part (2) by unsoldering it.

(7) Take off the circuit board (E) and replace it.

* If the socket (G) is replaced, remove the screws (*6) from the socket mount (F), cut the two binders (H) and remove the tube (I).

(8) Assemble them in reverse order .

5. Replacing Pinion Ass'y of Plane Stage



(1) Loosen the stopper (A) and remove the condenser (B) downward by turning the knob (F).

(2) Remove the left dovetail (C) as seen from the front side.

Screws : AB3X8SA, 2pcs. (*1)

(3) Remove the right dovetail (D).

Screws : AB3X8SA, 2pcs. (*2)

(4) Remove the pinion spring (E).

(5) Remove the pinion ass'y (F).

(6) Assemble the reverse order of disassembly.

Note on assembly :

1) Apply grease to the portions shown as the above figure.
2) The right dovetail (D) is mounted by pushing it in the arrow directions.
3) The left dovetail (C) is mounted by pushing it in the upward direction.
At this time, adjust the position of dovetail (C) in the left and right directions so that the condenser moves smoothly without a play (vertical movement).

CHAPTER 4
JIGS AND TOOLS / GREASES

1. List of Jigs and Tools

No.	Description	Ref. page
	Cleaning tools	2, 3, 4, 5
*1	Eyepiece for CX21 (It is necessary to set the cross micrometer disk *1.)	11, 12, 13
	Digital multimeter	18
	Philips screwdriver	12, 13, 15
	Allen screwdriver (2.5mm)	2, 14
	Allen wrench (1.5mm)	16
	Precision screwdriver	14
	Spanner	17
	Plier	17
	Dust cover	

*1 Contact your Authorized dealer.

2. List of Greases

No.	Description	Ref. page
OT2006	Grease (heavy)	17
OT2008	Grease (medium)	17, 19
OT2012	Mo grease	17

CHAPTER 5
MAINTENANCE PARTS

1. List of Maintenance Parts

Index No.	Order No.	Description	Ref. page
	*1	CX21 Instruction manual	
A001	AE085600	X-knob	16
A002	AW037500	Fine adjustment knob ass'y	17
A003	AE087300	Fine adjustment knob	
A004	DZ320900	Circuit board	18
A005	DH197500	Socket	
A006	DO008200	Binder	
A007	DO166600	Tube	
A008	AE088000	Dial	
	*1	6V20W halogen bulb	
A009	AW037600	Pinion ass'y	19

★The index No. are shown on the figures in "REPAIR PROCEDURE" instead of parts No.

*1 Contact your Authorized dealer.

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